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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/736,654	12/12/2000	Ron Kimmel	10990172-1	8266

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EXAMINER	
CHANG, JON CARLTON	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 12/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/736,654	KIMMEL ET AL.	
	Examiner	Art Unit	
	Jon Chang	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,11,12 and 15-17* is/are rejected.

7)☒ Claim(s) *3-10,13,14 and 18-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,262,738 to Gibson et al. (hereinafter "Gibson").

As to claim 1, Gibson discloses a method of generating a distance map comprising the steps of:

a) identifying a boundary curve of a source image (the edge of the object, column 4, line 46); and

b) assigning a distance value to each pixel of the distance map associated with a corresponding region of the source image, wherein for each pixel, the distance value represents a distance between a center of that pixel and a nearest point of the boundary curve, wherein the nearest point is located to sub-pixel accuracy (column 4, lines 41-49; column 6, lines 63-66; note that distance can be calculated at any arbitray location via interpolation, including between points, thus sub-pixel accuracy).

3. Claims 12 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,603,484 to Frisken et al. (hereinafter "Frisken").

As to claim 12, Frisken discloses a method comprising the steps of:

a) computing a first distance map of a source image (column, lines 1-4; column 8, lines 54-57); and

b) downsampling the first distance map having a first resolution to form a second distance map having a second resolution (column 17, line 66 to column 18, line 1; column 18, lines 20-22; note in Fig.15b, after combining, the distance map has a different resolution from that of Fig.15c, effectively downsampling the first map).

As to claim 15, Frisken discloses the method of claim 12 wherein the first resolution is greater than the second resolution (note in Fig.15b, the larger squares have a lower resolution that the smaller squares from Fig.15c).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gibson.

With regard to claim 11, Gibson does not disclose that the source image comprises boundary curves defined by continuous parametric functions. However, the Examiner takes Official Notice that it is well known to represent boundary curves by continuous parametric functions. There are inherent advantages in utilizing continuous parametric functions to represent boundary curves, including higher accuracy and increased storage efficiency. It would therefore have been obvious to one of ordinary skill in the art to implement continuous paraemetric functions to define the boundary curves in Gibson.

7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Gibson and U.S. Patent 4,670,892 to Abele et al. (hereinafter "Abele").

Regarding claim 2, Gibson does not discloses the limitations regarding step a). However, these are well known as evidenced by Abele. Abele discloses:

i) generating an unsigned graylevel image corresponding to a source image; and

ii) applying a threshold value to the unsigned graylevel image to form a signed graylevel image, wherein a sign change between graylevel values of adjacent pixels indicates a boundary curve intersection, wherein the sign change identifies the adjacent pixels as boundary pixels (column 4, lines 59-65).

Abele states that this provides the advantage of accentuating boundary regions (column 4, lines 64-65). This would enhance distance map computation in Gibson's invention. Therefore, it would have been obvious to implement Abele's technique in Gibson's invention.

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Frisken and Gibson.

With regard to claim 16, Frisken discloses the step of i) identifying at least one boundary curve of the source image, and ii) assigning a distance value to each pixel of the first distance map, wherein each pixel is associated with a region of a source image, wherein for each pixel, the distance value represents a distance between a center of that pixel and a nearest point of a nearest boundary curve (column 2, lines 32-38; column 8, lines 40-42). Frisken does not diclose that the nearest point is located to sub-pixel accuracy. However, Gibson teaches locating a nearest point to sub-pixel accuracy (column 6, lines 63-66; note that distance can be calculated at any arbitrary location via interpolation, including between points, thus sub-pixel accuracy). Both Frisken and Gibson deal with distance maps. Gibson's technique can yield more accuracy, therefore it would have been obvious to one of ordinary skill in the art to modify Frisken's invention according to Gibson.

9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Frisken, Gibson and Abele.

With respect to claim 17, neither Frisken nor Gibson discloses the limitations regarding step (a)(i). However, these are well known as evidenced by Abele. Abele teaches the step of applying a threshold value to a graylevel rendering of the source image to form a signed graylevel image, wherein a sign change between graylevel values of adjacent pixels indicates a boundary curve lies between centers of the adjacent pixels, wherein the sign change identifies the adjacent pixels as boundary pixels (column 4, lines 59-65). Abele states that this provides the advantage of accentuating boundary regions (column 4, lines 64-65). This would enhance distance map computation in Gibson's invention. Therefore, it would have been obvious to implement Abele's technique in Gibson's invention.

Allowable Subject Matter

10. Claims 3-10, 13-14 and 18-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

References Cited

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 4,712,248 to Hongo discloses a method and apparatus for object identification which utilizes distance map data.

"An Algorithm for a Generalized Distance Transformation Based on Minkowski Operations" by Wang et al. teaches obtaining a distance transformation using a two-scan algorithm based on Minkowski operations.

"Computer Recognition of Hand-Written Characters Using the Distance Transformation" by Kovacs et al. teaches applying a distance transform to recognition of characters.

"Grid Data Generation from Contour Images by Using Euclid Distance Transformation" by Lee et al. using Euclidean distance transformation to generate grid data.

"Linear Time Euclidean Distance Transform Algorithms" by Breu et al. teaches two algorithms for computing the Euclidean distance transform.

"Octree-Based Hierarchical Distance Maps for Collision Detection" by Jung et al. teaches a hierarchical reresentation for discretized distance maps.

"Using Distance Maps for Accurate Surface Representation in Sampled Volumes" by Gibson teaches using distance maps for surface represenation in sampled volumes.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jon Chang whose telephone number is (703)305-8439. The examiner can normally be reached on M-F 8:00 a.m.-6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-4700.

Jon Chang
Primary Examiner
Art Unit 2623

Jon Chang
December 15, 2003